STEVENS FILE

NOTICE OF RELEASE OF 'IMMIGRANT' FORAGE KOCHIA

U.S. Department of Agriculture Forest Service
Intermountain Forest and Range Experiment Station

and

Utah State Division of Wildlife Resources

and

U.S. Department of Agriculture Soil Conservation Service

and

University of Idaho Agricultural Experiment Station

and

University of Nevada Agricultural Experiment Station

and

Oregon State University Agricultural Experiment Station

and

Utah State University Agricultural Experiment Station

Announce the release and naming of 'Immigrant' Forage Kochia, (Kochia prostrata (L.) Schrad). Immigrant was introduced from the Stravropol Botanical Garden, USSR. It has been tested by the Soil Conservation Service in Idaho, Utah, Arizona, and New Mexico. Additional testing has been done by the Utah Wildlife Resources in 16 Utah counties; by USDA Forest Service Intermountain Forest and Range Experimental Stations in Utah, Nevada, Wyoming, and Idaho; Pacific Northwest Forest and Range Experiment Station in Oregon; and the Rocky Mountain Forest and Range Experiment Station in New Mexico. The USDA Agricultural Research Service has tested Immigrant in Oregon, Nevada, Wyoming, and Utah.

Immigrant is a perennial semi-evergreen subshrub adapted to greasewood-shadscale, sagebrush-grass, and pinyon-juniper rangelands in the inland west. It is an improved strain selected for its ability to compete with cheatgrass and halogeton on depleted rangelands.

Immigrant Forage Kochia has excellent forage quality in spring, summer, and fall. Sheep, cattle, and deer find it palatable. Immigrant has performed well on low and intermediate rainfall areas (8 to 27 inches average annual precipitation). Important characteristics exhibited by Immigrant are: ability to establish and persist on disturbed harsh soils, fairly high salt and drought tolerance, tolerance to temperature extremes (-25° to 104° F.), low oxalate levels, ability to spread rapidly from seed, high seed production, moderate shade tolerance, good palatability for livestock and big game, food and cover for upland game birds, fair fire tolerance, compatibility with other perennials, competitiveness towards annuals and the ability to increase fall and winter forage quality of perennial grass stands.

Breeder seed will be maintained by the Aberdeen Plant Materials Center, Aberdeen, Idaho. Recognized classes of seed are breeders, foundation, registered, and certified. Foundation seed will be available from the Aberdeen Plant Materials Center in early 1985 through soil conservation districts, agricultural experiment stations, and crop improvement associations. Registered and certified seed should be available in the fall of 1986.

Laurence E. Lassen, Station Director — 2/18/84 (Date)
USDA-Forest Service, Intermountain Forest and Range Experiment Station

Douglas F. Day, Director — 2/22/84 (Date)
Utah Division of Wildlife Resources

*Stanley N. Hobson, State Conservationist — 2/13/84 (Date)
USDA-Soil Conservation Service, Idaho

M U Wells Asst. AES Director — 03/02/84 (Date)
Dr. Lee A. Bulla, Director
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Dr. Doyle J. Mathews, Director — 03/08/84 (Date)
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John R Davis — Mar 14 1984

Dr. J. R. Davis, Director (Date)
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Thomas M. Shiflet — 3/22/84

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Bernard M. Jones — 3-30-84

Dr. Bernard Jones, Dean and Director (Date)
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*Stanley N. Hobson signing for State Conservationists of Idaho, Utah, Oregon, and Nevada.

U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

UTAH STATE DIVISION OF WILDLIFE RESOURCES

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE

recommend the naming and release of 'Preferred' kochia for commercial production and marketing of seed.

INTRODUCTION

Scientific Name: *Kochia prostrata* (L.) Schrad.

Common Name: Kochia, prostrate kochia, perennial summer cypress, prostrate summer cypress, green molly.

Varietal Name: 'Preferred'

Fig. 1--Two-year old plants of Preferred kochia established (broadcast seeding) in cheatgrass brome, providing green succulent forage in August.

Other Identification Used: P.I.-314929, U2, A-18223.

Origin: Preferred was introduced into the United States from Stravropol Botanical Gardens, USSR, May 19, 1966.

Description: Preferred kochia is a semi-evergreen subshrub or small shrub (Fig. 1) (to 3 feet tall). It has excellent forage quality in spring, summer, and fall and somewhat less in winter (Balyan 1972, Britton and Sneva 1977, Davis 1979, Davis and Welch 1983, Welch and Davis 1983). Sheep (Otsyina and others 1982, 1983, Gade 1983, Otsyina 1983), deer (Davis 1983) and cattle (Stevens 1983) find it palatable especially on dry ranges. Preferred has good resistance to grazing. The lower 1/3 of the plant is green year round. The upper stems and seed stocks which turn red in the fall (Fig. 2), dry up after seed shatter (Oct.-Nov.)

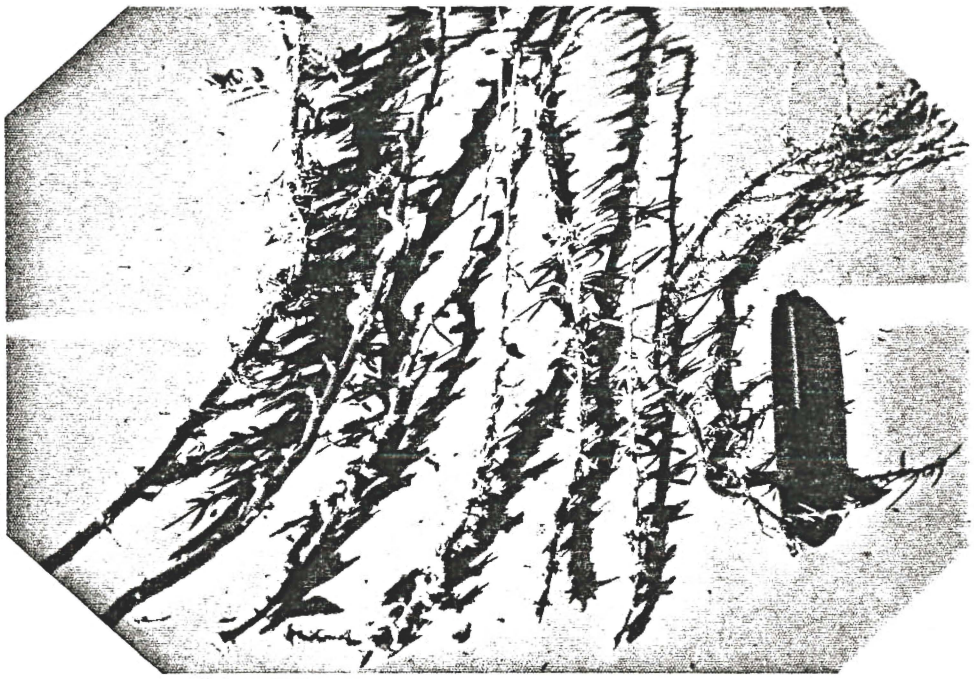

Fig. 2--Variation in the winter foliage of seven accessions of Kochia prostrata. Preferred is on the extreme right.

(Davis and Welch 1983). Grazing animals will paw through snow to get to the green base. Preferred has performed well in low to intermediate rainfall areas, (5-27 inches) on disturbed sites, in mineral soils and in competition with weedy annuals like halogeton (Fig. 3) and cheatgrass (Fig. 4) throughout the inland west (McArthur and others 1974, Blauer and others 1976, Britton and Sneva 1977, Davis 1979, Aldon and Pase 1981, Edgerton 1983, Everett 1983, Haferkamp 1983, Howard 1983, Jordan 1983, Monsen 1983, Stevens and Van Epps 1983, Turnipseed 1983). Preferred germinates in late February and early March and can develop 10 to 18 leaves before halogeton starts to grow (Stevens 1983).

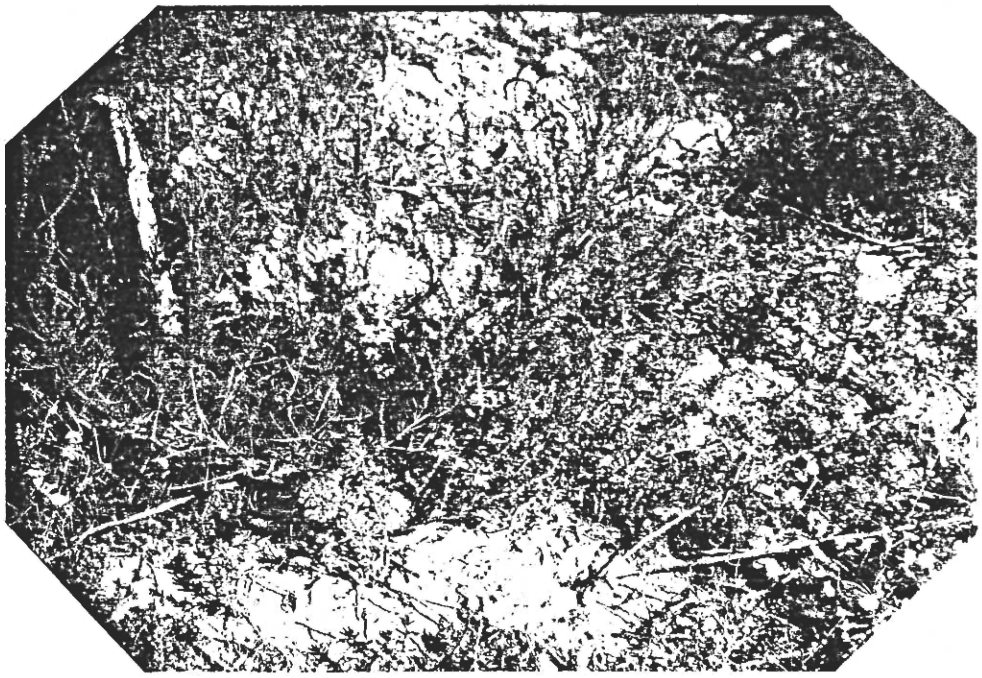

Fig. 3--One year old plants of Preferred kochia growing with halogeton. Preferred seed was broadcast on undisturbed soil.

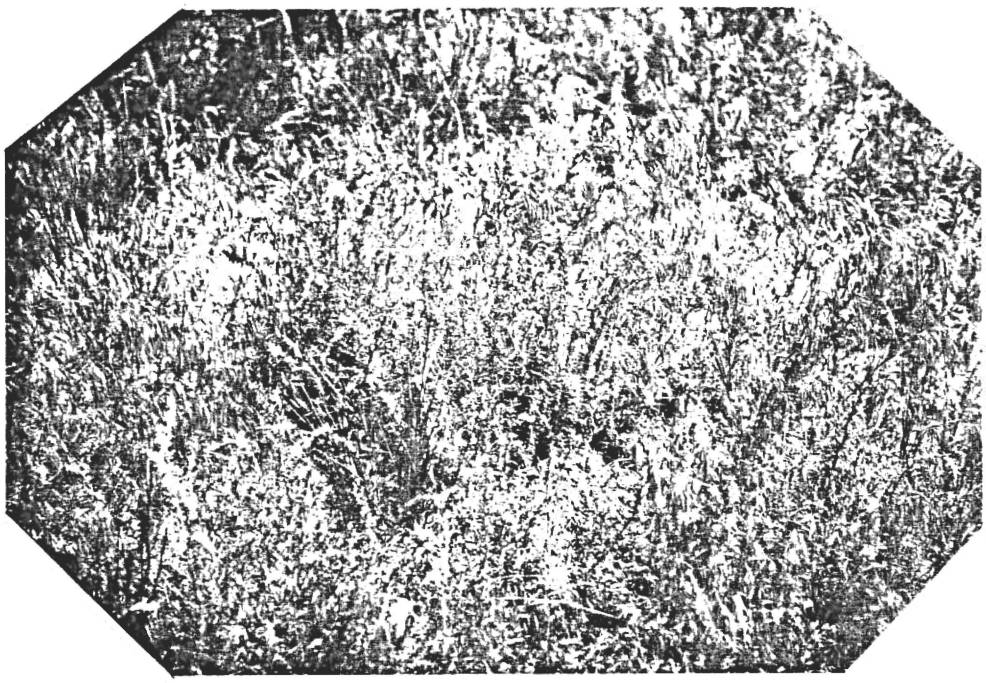

Fig. 4--One-year old plants of Preferred kochia growing with cheatgrass brome. Seed was broadcast on disturbed soil.

Preferred is especially well adapted to salt desert shrub, sagebrush-grass and pinyon-juniper communities (Fig. 6). There is considerable variation in the accessions tested (Fig. 2), of twelve accessions that have had chromosome number determined, two had 2n=18, three had 2n=36 and six had 2n=54 (McArthur and Sanderson 1983). Preferred has a chromosome number of 2n=18 (Pope and McArthur 1977).

Method of Development: Preferred came into the United States in 1966. Seed was produced by the Pullman Plant Introduction Station in 1967 and sent to Experiment Stations, Plant Material Centers and Universities. Eighteen or more accessions of Kochia prostrata have come into the United States. Preferred has been the superior performing accession in experimental seeding trials, rangeland seedings, and on mine spoils and

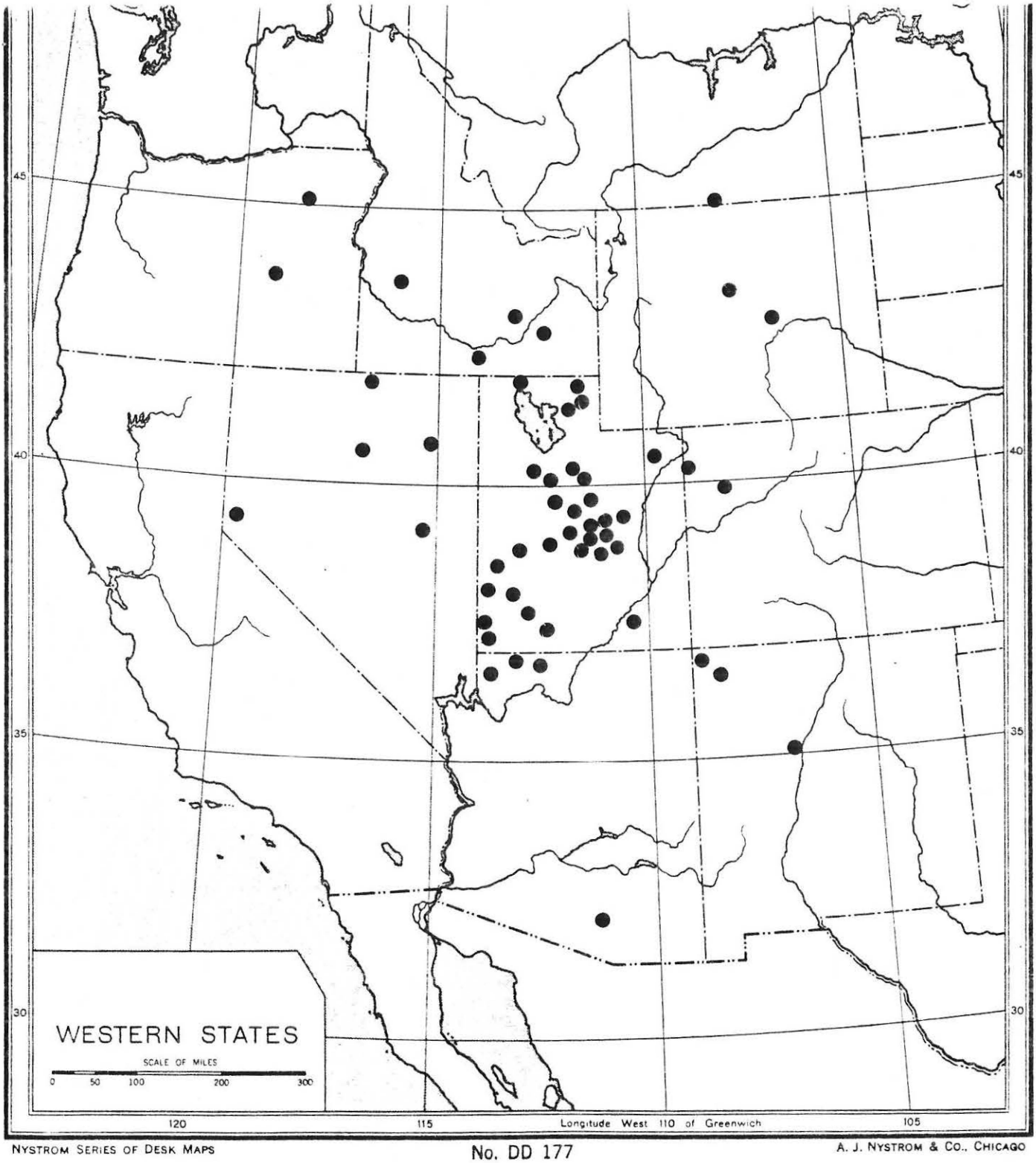

Fig. 5--Dots indicate locations where Preferred kochia has been successfully established by direct seeding or transplanting.

disturbed areas in Utah, Idaho, Nevada, Oregon, Arizona, New Mexico, and Wyoming (Edgerton 1983, Everett 1983, Garrison 1983, Haferkamp 1983, Howard 1983, Jordan 1983, Monsen 1983, Sant 1983, Stevens 1983, Turnipseed 1983).

Of all the accessions comparatively tested in the United States, Preferred has demonstrated a general overall superiority in longevity, forage production, forage quality, palatability and competitiveness with annuals.

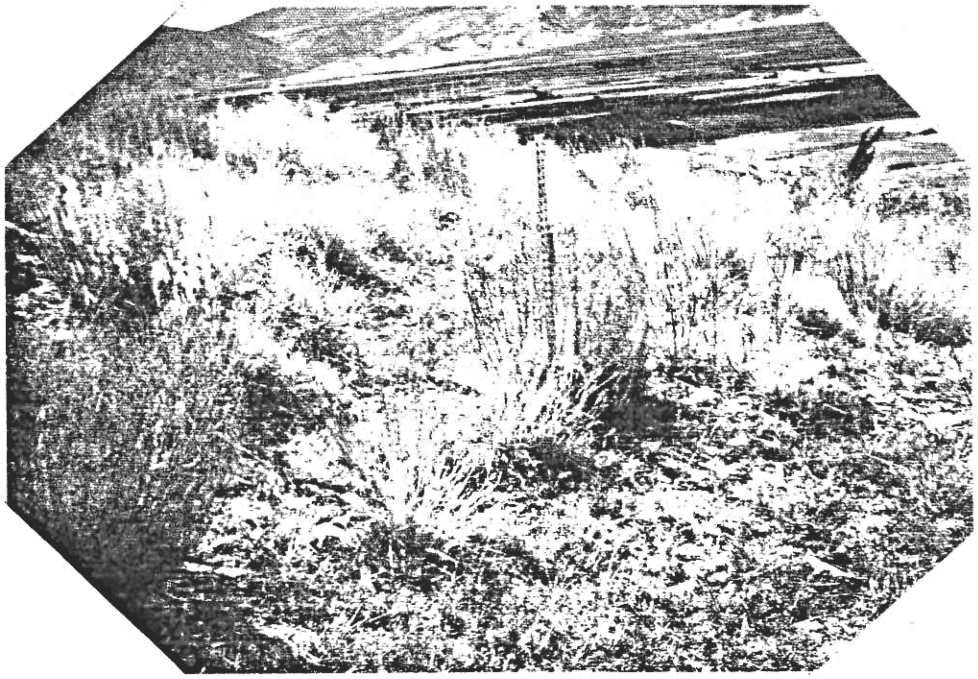

Fig. 6--Preferred kochia established with intermediate wheatgrass, crested wheatgrass, Indian ricegrass, cheatgrass brome and bottlebrush squirreltail on a chained and seeded pinyon-juniper site. Early September. Note greenness of Preferred kochia.

Uses: Preferred was selected for its ability to establish and persist in the pinyon-juniper, sagebrush-grass and salt desert shrub types. It has good potential as a year round forage crop (Fig. 6) and for erosion control and critical area treatment. Important characteristics exhibited by Preferred are: ability to establish and persist on disturbed harsh soils, fairly high salt and drought tolerance, tolerance to temperature extremes (-25° to 104°F), low oxalate levels, ability to spread rapidly from seed, high seed production, moderate shade tolerance, good palatability for livestock and big game, food and cover for upland game birds, fair fire tolerance, compatibility with other perennials, competitiveness toward annuals and the ability to increase fall and winter forage quality of perennial grass stands (Fig. 6) (Keller and Bleak 1974, McArthur and others 1974, 1978, Sneva 1975, Francois 1976, Moghaddam 1976, 1978, Britton and Sneva 1977, Menati 1977, Davis 1979, Frischknecht and Ferguson 1979, Waller and others 1979, Alimov and Amirkhonov 1980, Williams 1980, Aldon and Pase 1981, Otsyina and others 1982, Davis and Welch 1983, Gade 1983, McArthur and Stevens 1983, Otsyina 1983, Welch and Davis 1983).

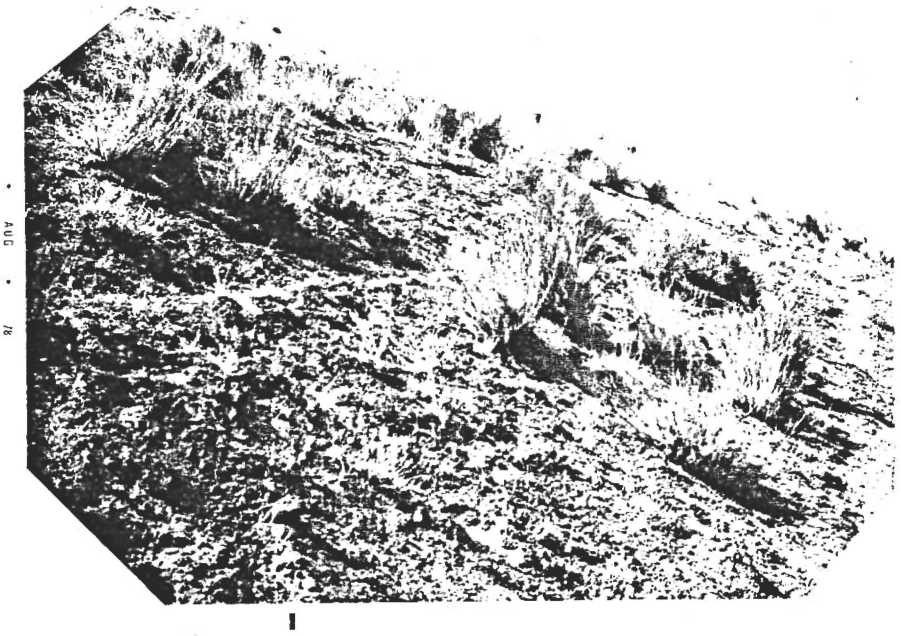

Fig. 7--Three-year old plants of Preferred kochia established on a road cut with heavy clay soil. Note reproduction of Preferred.

Areas of Adaptation: Throughout the Intermountain West, Preferred has done well in basic soils but has performed poorly in neutral and acid soils. It performs well on different textured soils ranging from sandy loam to heavy clay, it does especially well in heavier soils (Fig. 7).

Areas of greatest adaptation are in greasewood-shadscale (Fig. 8), basin big sagebrush, Wyoming big sagebrush and pinyon-juniper communities. It out-competes many annuals and fills in the interspaces between perennials (Fig. 9) and establishes, when seeded, with other perennials.

Preferred has performed well with 5 to 27 inches of annual precipitation. In Iran K. prostrata has done well with 6 to 8 inches (Moghaddam 1976) and in Russia with as low as 3.6 inches (USDA 1961).

Preferred develops a fibrous root system with a large deep tap root (Fig. 10).

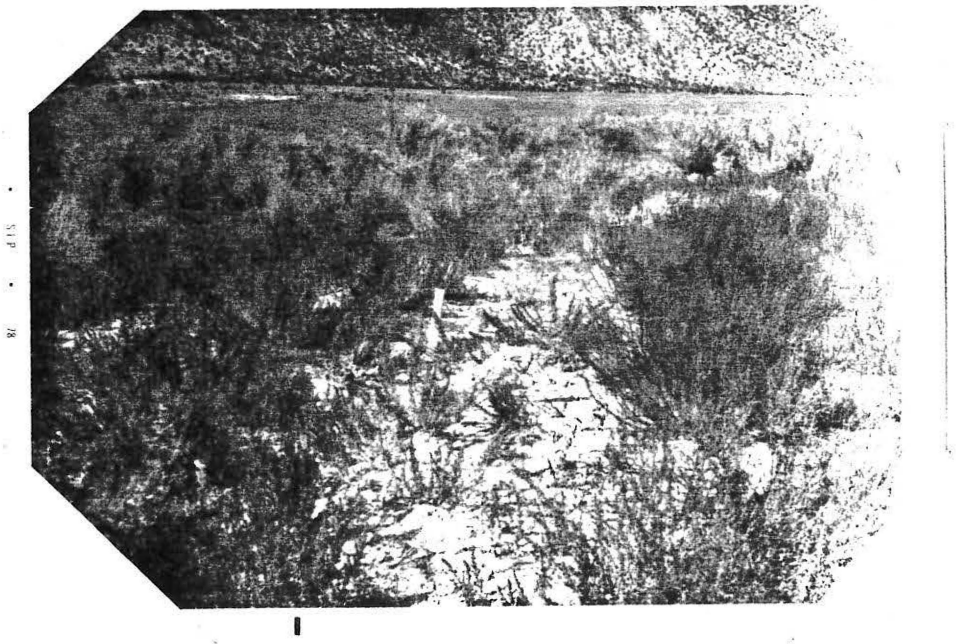

Fig. 8--Preferred kochia established in a black greasewood shadscale halogeton community. September.

Diseases and Insect Problems: No disease or serious insect problems have been observed during the development period. Preferred has been shown to be a host for the Lygus Bug (Lygus desertinus), and it has been recommended that Preferred be seeded in mixtures with other species so that high insect populations are not encouraged (Moore and others 1982).

Fig. 9--Spread of Preferred kochia (direction of the prevailing winds) into an intermediate wheatgrass, crested wheatgrass, cheatgrass brome communities. Late November.

Seed Characteristics and Production: Preferred is a high seed producer on rangelands and when grown under cultivation. At the Great Basin Station, Ephraim, Utah, with rows on 24-inch spacing, over an 8-year period, cleaned seed production averaged 1,532 lbs. per acre; with a low of 1,160 lbs. and a high of 2,368 lbs. per acre. After 5 or 6 years, seed production began to taper off due to the dominance, size and woodiness of large plants. Seed production can be reduced by competition from reproduction (Fig. 12). It is recommended that seed-producing stands be cultivated annually. Under cultivation seed

can be combine harvested following the firest heavy frost. Plants can, however, be swathed prior to the frost, dried and seed combined out of the swath.

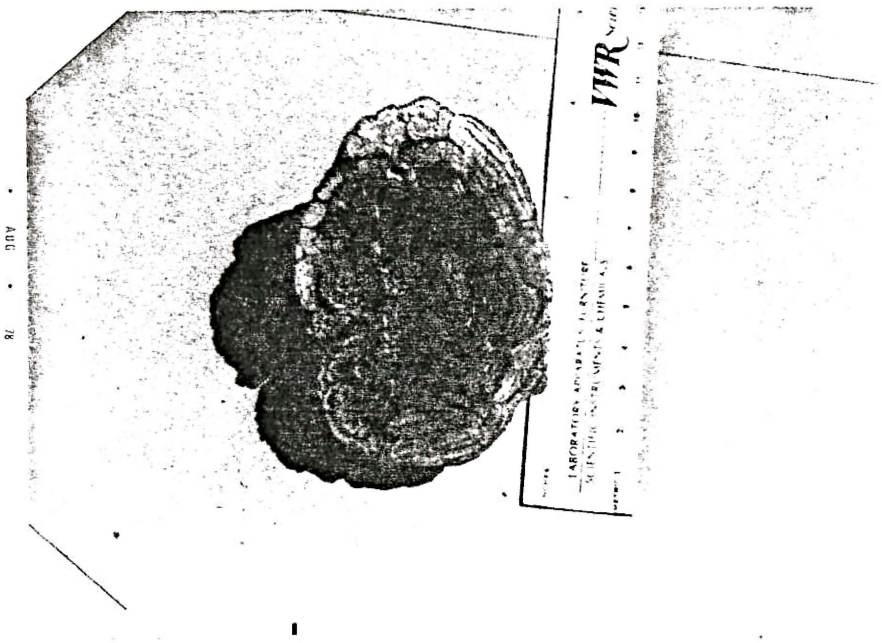

Fig. 10--Cross section of a tap root from a three-year old plant of Preferred kochia.

At 100 percent purity, there are 520,000 seeds per pound. Seed of Preferred germinates rapidly over a wide range of temperatures (Young and others 1981). Seed does not retain acceptable viability with standard cleaning and storage procedures. In order to maintain at least 60 percent germination with 100% pur. by - brush removal with three years of storage, seed needs to be dried to 7 percent moisture, stored in an air and moisture tight container and placed in cool storage (36° to 50°F) (Jorgensen and Davis 1983).

Recommended seeding rate for seed production is 10 to 15 seeds per linear foot of row, with rows on 30-inch centers. Seed should not be

seeded more than 1/16 inch deep. Where transplants are used, one every 12 to 14 inches is recommended. Direct seeding on rangeland is best accomplished in the fall or winter by broadcasting on top of disturbed or undisturbed soil or at very shallow depths (USDA 1961, Stevens and Van Epps 1983, Romo and Haferkamp 1983).

In rangeland seedings, consistent good stands of Preferred have not been obtained. Establishment problems have probably been associated with low seed viability and improper seeding. With proper seed handling (Jorgensen and Davis 1983) and seeding techniques (Stevens and Van Epps 1983) good stands of Preferred can be expected.

Once established, Preferred maintains itself and increases its range by seed. Russian researchers have been evaluating Kochia prostrata since 1928 and have been seeding it since 1932 (Balyan 1979) (Fig. 12).

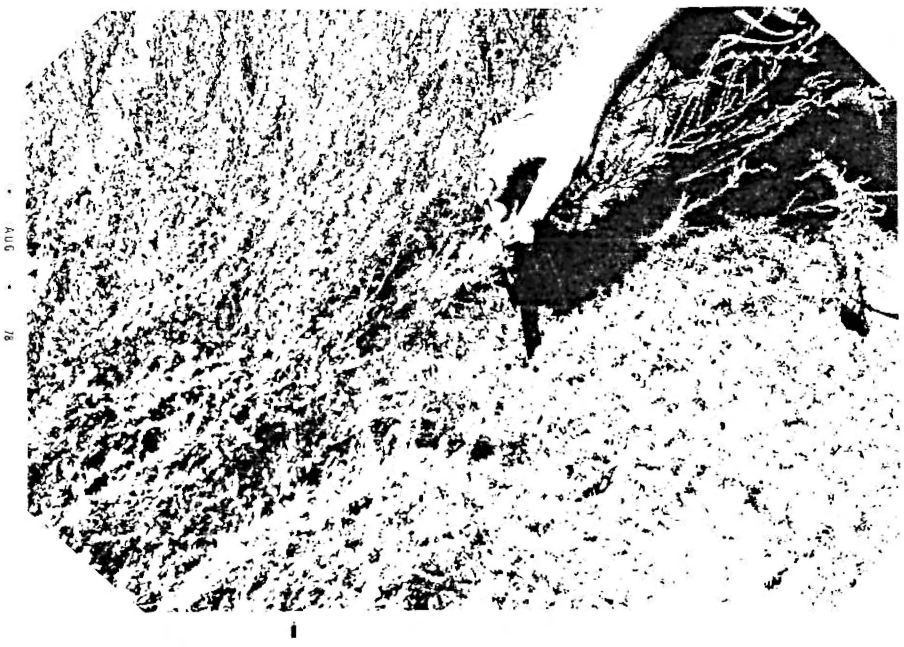

Fig.11--Reproduction of Preferred kochia in seed production areas. Late July.

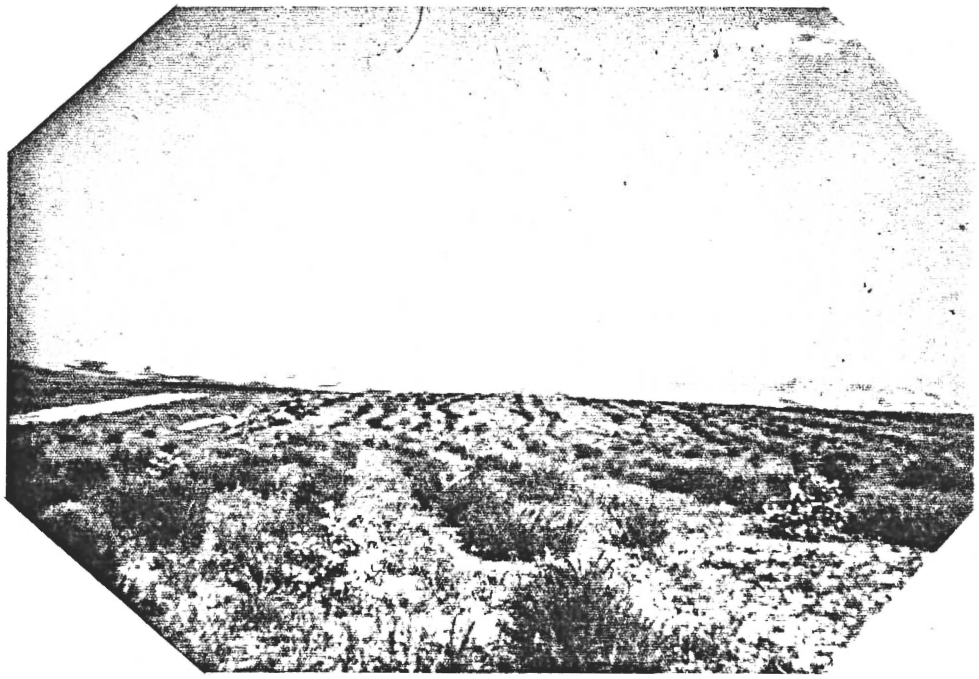

Fig. 12--Kochia prostrata interseeded into native grass community in the Ural mountains area of the Soviet Union.

Increase and Distribution: Breeder plants will be maintained by the Aberdeen Plant Material Center, Aberdeen, Idaho. Recognized classes of seed will be breeder, foundation, registered and certified.

Registered seed will be available in 1984 through local Soil Conservation districts, state agricultural stations and crop improvement associations of Idaho and Utah.

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[1]Federal Aid in Wildlife Restoration Project W-82-R.

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